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| APPLICATION NO.                              | FILING DATE | FIRST NAMED INVENTOR  | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|-------------|-----------------------|---------------------|------------------|
| 10/680,260                                   | 10/08/2003  | David William Abraham | YOR920030013US1     | 5657             |
| 48150  | 7590        | 10/28/2005            | EXAMINER            |                  |
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| 8321 OLD COURTHOUSE ROAD                     |             |                       |                     |                  |
| SUITE 200                                    |             |                       | ART UNIT            |                  |
| VIENNA, VA 22182-3817                        |             |                       | PAPER NUMBER        |                  |
|  |             |                       | 2814                |                  |

DATE MAILED: 10/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/680,260

Applicant(s)

ABRAHAM ET AL.

Examiner

Anh D. Mai

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 15 September 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### *Status of the Claims*

1. Amendment filed September 15, 2005 has been entered. Claims 27-31 have been cancelled. Claims 1, 2, 7 and 13 have been amended. Claims 1-26 are pending.

### *Declaration Under 37 C.F.R. § 1.131*

2. The Declaration filed on September 15, 2005 under 37 CFR 1.131 has been considered but is ineffective to overcome the Kamata '224, Grynkewich '351 and Klemmer '349 references.

3. The Grynkewich '351 and Klemmer '349 references are U.S. patent or U.S. patent application publication of a pending or patented application that claims the rejected invention. An affidavit or declaration is inappropriate under 37 CFR 1.131(a) when the reference is claiming the same patentable invention, see MPEP § 2306. If the reference and this application are not commonly owned, the reference can only be overcome by establishing priority of invention through interference proceedings. See MPEP Chapter 2300 for information on initiating interference proceedings. If the reference and this application are commonly owned, the reference may be disqualified as prior art by an affidavit or declaration under 37 CFR 1.130. See MPEP § 718.

4. The evidence submitted is insufficient to establish diligence from a date prior to the date of reduction to practice of the Kamata '224, Grynkewich '351 and Klemmer '349 references to

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either a constructive reduction to practice or an actual reduction to practice. There is no showing of the works following the conception of 08/15/2000 to March 29, 2002.

5. The evidence submitted is insufficient to establish a reduction to practice of the invention in this country or a NAFTA or WTO member country prior to the effective date of the Kamata '224, Grynkewich '351 and Klemmer '349 references. There is no evidence that a working device has been made prior to March 29, 2002.

#### *Claim Objections*

6. Claim 13 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

Claim 13 recites: further comprising producing a magnetic device.

Since claim 13 fails to add more limitation to claim 1, claim 13, thus, fails to further limit claim 1.

#### *Claim Rejections - 35 USC § 112*

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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7. Claim 13 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 13, recites: "producing a magnetic device".

What is the magnetic device ?

Is the device produced by claim 1 not a magnetic device ?

What is the difference between the magnetic device produced by claim 1 and that of claim 13 ?

Claim 13 recites "further comprising: producing a magnetic device" but without providing any other process steps that already recited in claim 1, thus, claim 13 is indefinite.

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 1-11, 13-15, 17, 19 and 22-26 are rejected under 35 U.S.C. 102(e) as being anticipated by Kamata et al. (U.S. Patent No. 6,841,224) of record.

With respect to claim 1, Kamata teaches method of patterning a magnetic thin film as claimed including:

transforming a portion of the magnetic thin film (20) to be non-magnetic and electrically insulating (40) using a chemical transformation ( $F^*$ ). (See Figs. 3A-B).

With respect to claim 2, the method of Kamata further includes: providing a mask (30) over the portion of the magnetic thin film (20) to be preserved using photolithography.

With respect to claim 3, the method of Kamata further includes: transforming (converting) the portion of the magnetic thin film (20) by a reactive plasma.

With respect to claim 4, using the chemical transformation of Kamata includes using a fluorine-based reactive plasma.

With respect to claim 5, the fluorine-based reactive plasma of Kamata  $CF_4$ ,  $SF_6$ ,  $CHF_3$ .

With respect to claim 6, the pressure used in the converting of Kamata is within a range of about 10 mT to about 30 mT.

With respect to claim 7, the portion of the magnetic thin film (20) of Kamata comprises of alloys of nickel, iron, and cobalt, and the transforming (converting) comprising transforming (converting) the alloys of nickel, iron, and cobalt, to a fluorine-containing film.

With respect to claim 8, the fluorine-containing film (40) is non-ferromagnetic.

With respect to claim 9, the fluorine-containing film (40) of Kamata is non-magnetic.

With respect to claim 10, the fluorine-containing film (40) of Kamata is electrically insulating.

With respect to claim 11, the mask (30) of Kamata comprises a photoresist.

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With respect to claim 13, as best understood by the examiner, the method of Kamata further includes: producing a magnetic device.

With respect to claim 14, the using chemical transformation of Kamata can be performed at room temperature.

With respect to claim 15, the reactive plasma of Kamata includes a fluorocarbon.

With respect to claim 17, the reactive plasma of Kamata includes sulfur hexafluoride.

With respect to claim 19, the pressure of Kamata is selectively employed for the plasma sputtering such that the magnetic thin film material (20) is substantially free of erosion.

With respect to claim 22, the mask of Kamata comprises an insulating hard mask (360), the method of Kamata further includes: after the converting, selectively etching the insulating hard mask (360) to pattern the insulating hard mask.

Regarding the term insulating hard mask, the photoresist material (360) of Kamata is considering an insulating hard mask since there is no specific insulating material is required.

With respect to claim 23, the method of Kamata further includes: forming a conductive material (380) over the area where the insulating hard mask (360) was etched.

With respect to claim 24, the reactive plasma of Kamata includes a fluorine-containing gas.

With respect to claim 25, the magnetic thin film (20) of Kamata includes a magnetic tunnel junction (MTJ), and wherein after the converting portion, the edges of the magnetic tunnel junction have no exposure to oxygen. (see Figs 13).

With respect to claim 26, the edge smoothness of the MTJ of Kamata is inherently determined by a line edge roughness of the mask (360).

9. Claims 1-3, 11-14 and 19-26 are rejected under 35 U.S.C. 102(e) as being anticipated by Grynkewich et al. (U.S. Patent No. 6,881,351).

With respect to claim 1, as best understood by the examiner, Grynkewich teaches method of patterning a magnetic thin film as claimed including:

transforming a portion of the magnetic thin film (24) to be non-magnetic and electrically insulating (30) using a chemical transformation. (See Fig. 2).

With respect to claim 2, the method of Grynkewich further includes: providing a mask (28) over the portion of the magnetic thin film (24) to be preserved using photolithography.

With respect to claim 3, the method of Grynkewich further includes: converting the portion of the magnetic thin film (24) by a reactive plasma.

With respect to claim 11, the mask (28) of Grynkewich is provide on the magnetic thin film utilizing a well known techniques to form a mask, hence comprises a photoresist.

With respect to claim 12, the mask of Grynkewich comprises a hard mask patterned layer (26/28) comprising one of TaN.

With respect to claim 13, the method of Grynkewich further includes: producing a functioning magnetic device.

With respect to claim 14, the using chemical transformation of Grynkewich can be performed at room temperature.



With respect to claim 19, the pressure of Grynkewich is selectively employed for the plasma sputtering such that the magnetic thin film material (24) is substantially free of erosion.

With respect to claim 20, the method of Grynkewich further includes:

forming an insulating layer (36) over the converted portion (30) of the magnetic thin film (24) and the mask (28); and

etching the insulating layer (38) and the mask (28) to planarize the upper level of the mask (28) and the insulating layer (38). (See Figs. 3-6).

With respect to claim 21, the method of Grynkewich further includes:

selectively etching the mask (28); and

forming a conductive material (42) over the insulating layer (38) and an area where the mask (28) was selectively etched.

With respect to claim 22, the mask of Grynkewich comprises an insulating hard mask (28), the method of Grynkewich further includes: after the converting, selectively etching the insulating hard mask (28) to pattern the insulating hard mask.

Regarding the term insulating hard mask, the mask (28) of Grynkewich is considering an insulating hard mask since there is no specific insulating material is required.

With respect to claim 23, the method of Grynkewich further includes: forming a conductive material (42) over the area where the insulating hard mask (28) was etched.

With respect to claim 24, the reactive plasma of Grynkewich includes a O<sub>2</sub>.

With respect to claim 25, the magnetic thin film (24) of Grynkewich includes a magnetic tunnel junction (MTJ), and wherein after the converting portion (30), the edges of the magnetic tunnel junction (32) have no exposure to oxygen.

With respect to claim 26, the edge smoothness of the MTJ of Grynkewich is inherently determined by a line edge roughness of the mask (28).

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 12, 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamata '224 as applied to claims 2 and 3 above, and further in view of Grynkewich '351.

With respect to claim 12, Kamata is shown to teach all the features of the claim with the exception of utilizing a metal hard mask.

However, Grynkewich teaches utilizing photolithography to provide a mask including TaN (26).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to provide a hard mask of Kamata including a TaN masking layer protect a certain portion of the magnetic thin film from converting.

With respect to claim 20, Kamata teaches a method of chemical transformation converting a portion of magnetic thin film by reactive plasma.

Thus, Kamata is shown to teach all the features of the claim with the exception of further process step.

However, Grynkewich teaches process steps following the conversion including:

forming an insulating layer (36) over the converted portion (30) of the magnetic thin film (24) and the mask (28); and

etching the insulating layer (36) and the mask (28) to planarize the upper level of the mask (28) and the insulating layer (36). (See Figs. 1-6).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to further process the converted magnetic thin film of Kamata utilizing the process step as taught by Grynkewich to complete the magnetic device.

With respect to claim 21, the method of Kamata, further includes:

selectively etching the mask (360); and forming a conductive material (380) over the insulating layer and the area where the mask (380) was selectively etched. (See Fig. 13C).

11. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kamata or Grynkewich as applied to claim 3 above, and further in view of Klemmer et al. (U.S. Patent No. 6,849,349) of record.

Kamata or Grynkewich teaches converting a portion of a magnetic thin film by a reactive plasma.

Thus, Kamata or Grynkewich is shown to teach all the features of the claim with the exception of using argon for the reactive plasma.

However, Klemmer teaches: other species such as argon can be used to convert a portion of a magnetic thin film (14) in to non-magnetic (14b). (See Fig. 2).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to convert a portion of the magnetic thin film of Kamata or Grynkewich utilizing argon as taught by Klemmer to convert the magnetic material into non-magnetic material without removing the converted portion, such portion can be used for insulation.

12. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kamata '224.

Kamata teaches converting a portion of the magnetic thin film (20) into non-magnetic insulating (40).

Thus, Kamata is shown to teach all the features of the claim with the exception of explicitly to include bromide.

However, Kamata teaches the reactive gas containing halogen. It is well known that bromide in a halogen gas.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to converting a portion of the magnetic thin film of Kamata utilizing bromide, since bromide as well as iodide, fluoride or chloride are member of reactive gas known halogen.

*Response to Arguments*

13. Applicant's arguments filed September 15, 2005 have been fully considered but they are not persuasive.

Declaration Under 37 C.F.R. § 1.131

Applicant appears to contend that all three references: Kamata '224, Grynkewich '351 and Klemmer '349 have been removed as references by swearing behind the filing dates of the references.

However, since Klemmer '349 (see claim 1) and Grynkewich '351 (see claim 10) are claiming the "same patentable invention" namely, transforming a portion of magnetic thin film into non-magnetic, insulative using a chemical transformation, therefore, 37 C.F.R. 1.131 is not available to overcome the references.

Further, if 37 C.F.R. 1.131 is available, it requires beside the showing of conception but also due diligence and reduction to practice.

*Due diligence*, the exhibit show a conceive date back to 08/15/2000. This evidence show lacking due diligence since the exhibits fails to show any works from conception to March 29, 2002.

*Reduction to practice*, there is no evidence that a working device had been made.

Therefore, the rejections under the previously cited references are maintained.

*Conclusion*

14. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh D. Mai whose telephone number is (571) 272-1710. The examiner can normally be reached on 8:00AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



ANH D. MAI  
PRIMARY EXAMINER